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An annotated checklist of the herpetofauna of the Sibiloi National Park in northern Kenya based on field surveys

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***Abstract.*—The xeric Lake Turkana area in northern Kenya is often referred to as the "Cradle of Mankind" due to the abundance of hominin fossils. Sibiloi National Park in the Turkana Basin has been well studied for its fossils, but the extant biodiversity of the park remains largely under-surveyed. Today, the ecosystem is threatened by climate change, increasing human population pressure, poaching pressure, overgrazing by domestic stock, and a series of major hydropower dams and irrigated agricultural schemes (particularly the Gilgel Gibe III Dam) in Ethiopia, which may have a negative impact on the water supplies of the lake. The Turkana Basin has a high diversity of arid land herpetofauna, particularly terrestrial geckos. However, due the region's remoteness many expected species have never been recorded within the National Park. Here we provide an annotated list of the rich reptile and amphibian fauna based on two recent field surveys, including multiple first records for Sibiloi National Park. The surveys yielded records for 34 species, including six amphibians and 28 reptiles (one fresh water turtle, one crocodile, 18 lizards, and eight snakes). In total, 49 species of herpetofauna are currently known for Sibiloi National Park, including eight amphibians and 41 reptiles (three fresh water turtles, one crocodile, 25 lizards, and 12 snakes). Of those, five species are protected by the Convention on International Trade in Endangered Species (CITES; Appendices I, II, or III), i.e., *Trionyx triunguis*, *Crocodylus niloticus*, *Varanus albigularis*, *Varanus niloticus*, and *Eryx colubrinus* (all Appendix II). Three species are listed on the International Union for Conservation of Nature (IUCN) Red List (Vulnerable, Data Deficient), i.e., *Sclerophrys turkanae*, *Trionyx triunguis*, and *Pelusios broadleyi*. Two species (one toad, *Sclerophrys turkanae*, and one terrapin, *Pelusios broadleyi*) are endemic to Kenya and most likely endemic to the vicinity of Lake Turkana. Overall, the herpetofauna of the Sibiloi National Park already seems to be negatively affected and is further threatened by climate change and land use activity. Furthermore, the area comprises a number of CITES listed and IUCN Red List species other than the herpetofauna, including endemics, that warrant protection and conservation measures to prevent further defaunation.**

Keywords. *Amphibians, climate change, conservation, field body temperature, Lake Turkana, land use, pastoralism, reptiles, Turkana Basin Institute*

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Introduction

Reptiles and amphibians are currently considered to be among the world's most endangered groups, with 40.7% of amphibians and 21.1% of reptiles threatened with extinction (Cox et al. 2022). This is perhaps attributed to the fact that they are sensitive to habitat destruction and fragmentation, various environmental changes, pollution, and climate change. Such threats are linked to both anthropogenic activities and natural causes. In East Africa, the distribution ranges of many amphibians and reptiles are still poorly known due to the vast areas that have yet to be explored by herpetologists (Spawls et al. 2018; Tolley et al. 2016). Nevertheless, even the limited herpetological research conducted to date clearly indicates a high diversity of amphibians and reptiles in East Africa, including

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many threatened and endemic species (Channing and Howell 2006; Largen and Spawls 2010; Spawls et al. 2018, 2019; Tolley et al. 2016).

Sibiloi National Park (SNP) is located in Marsabit County in northern Kenya and about 1,570 km² in size (Fig. 1). The park lies in the xeric Gregory Rift (the eastern branch of the East African Rift fracture system) on the northeastern shore of Lake Turkana (formerly Lake Rudolf), the largest permanent desert lake and the largest alkaline lake on Earth. The lake is part of an endorheic basin, with three rivers (Omo, Turkwel, and Kerio) supplying most of the lake's water, and it has no outflow. The area is often referred to as the "Cradle of Mankind" because it is quite famous for its hominin fossils, in particular *Australopithecus* and early *Homo* fossils. The park was established in 1973 by the government of Kenya, mainly for the protection of its paleontological sites, and was named for Mount Sibiloi which is located at its southern boundary. Together with the South Island and the Central Island National Parks, the Lake Turkana National Parks were declared as a UNESCO World Heritage site in 1997. The site was listed as a World Heritage Site in Danger in 2018, mostly owing to large-scale transfrontier hydrological projects, in addition to climate change, increasing human population pressure, poaching pressure, and overgrazing by domestic stock.

The Lake Turkana area is characterized as a desert and xeric shrubland biome (Somali-Maasai xeric grasslands and shrublands ecoregion; Olson et al. 2001), and contains a variety of different habitats (Fig. 2). The area is surrounded by *Acacia* (now *Vachellia*)-*Commiphora* bushland and thicket (Olson et al. 2001), bordering the Chalbi Desert to the East, and elevations range from around 340 m to 550 m (Thorsell 2003). The plains are dominated by sand, silt, and gravel and are interspersed with volcanic formations, which include Mount Sibiloi and its remains of an approximately 7 MYA old petrified forest (Thorsell 2003). The climate is generally hot and dry, with the annual rainfall of about 250 mm mainly restricted to March and April (Thorsell 2003). Temperatures at the nearest weather station in Lodwar on the western side of Lake Turkana average 32 °C throughout the year, with an average annual maximum of 37 °C and average annual minimum of 26 °C (Mbaluka and Brown 2016). There are six major ethnic groups living adjacent to the eastern side of the lake, including the Daasanach, Gabbra, Turkana, Elmolo, Rendille, and the Samburu (Kaijage and Nyagah 2009). Pastoralism (mainly goats and sheep, but also cattle, donkeys, and camel), agro-pastoralism, and fishing are the main sources of livelihood for the local population. Due to the ever-growing population around the lake, these land use practices together with frequently occurring droughts have a degrading impact on the habitats of the area.

The vegetation is dominated by perennial and annual grassy plains and dwarf shrublands, covered with the grass *Aristida* sp. and the common dwarf shrubs *Indigofera spinosa* and *Duosperma longicalyx* (Mbaluka and Brown 2016). Much of the lake shoreline is occupied by perennial grasslands with the halophyte *Sporobolus spicatus* and *Dactyloctenium* sp. (Mbaluka and Brown 2016). However, large parts of the shoreline in the study area are completely devoid of vegetation or scattered with dead reed tussocks in some areas. Woodlands and forests are only associated with ephemeral streams and are dominated by *Vachellia tortilis* (Mbaluka and Brown 2016).

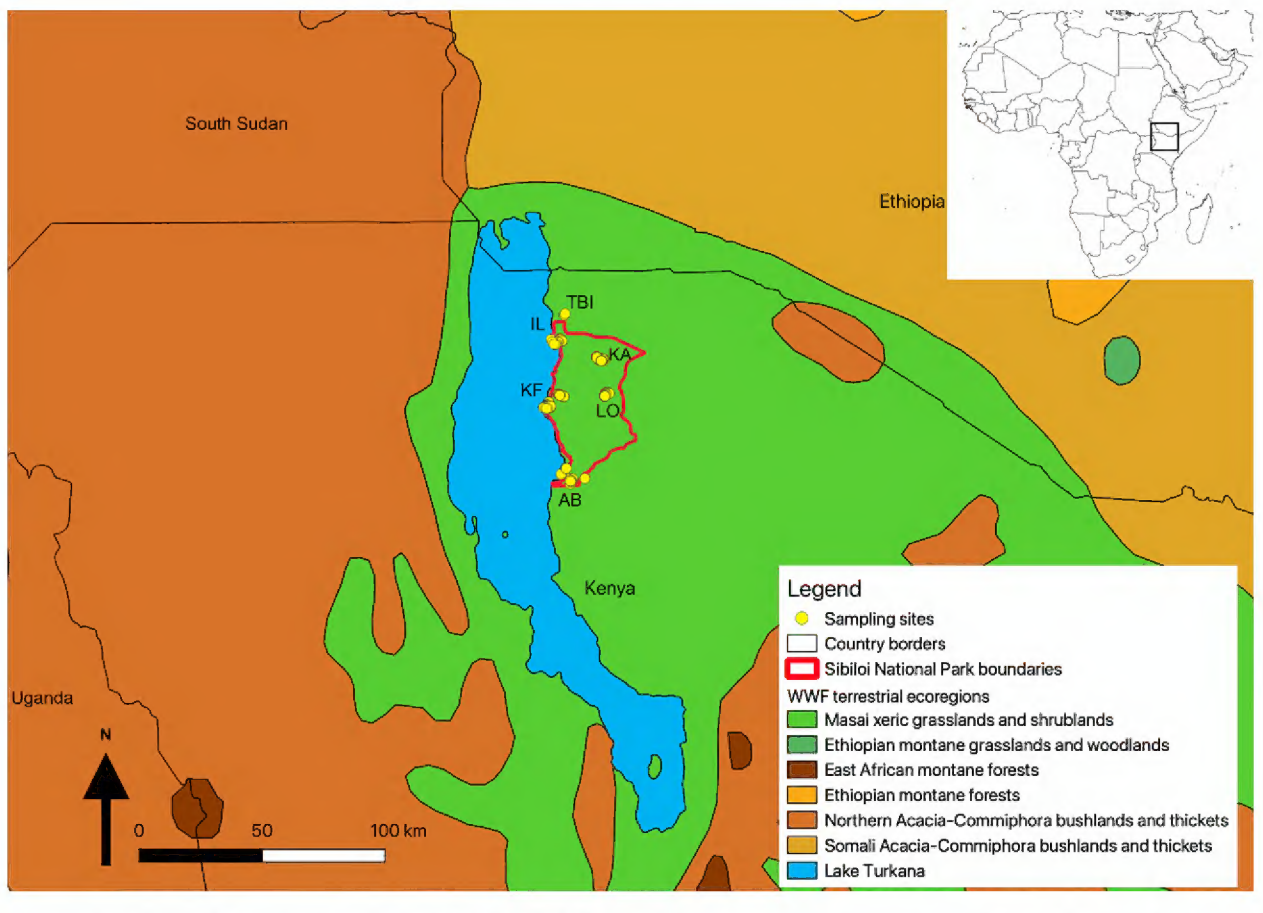

Fig. 1. Location of Sibiloi National Park (UNEP-WCMC and IUCN 2022) in Kenya and the main study sites: IL (Ilkemere), KA (Karare), KF (Koobi Fora), LO (Lomosia), AB (Alia Bay), and TBI (Turkana Research Institute). The inset map shows the African continent, and the black square indicates the location of the enlarged map.

According to the latest IUCN Conservation Outlook Assessment for the area (IUCN World Heritage Outlook 2020), the local mammal fauna is largely depleted. Notably, the hippopotamus, wild dog, lion, cheetah, Reticulated Giraffe, Grevy's Zebra, and Lelwel Hartebeest are species which were formerly abundant there but are now considered rare, endangered, or locally extinct. Historical data indicate that the lake once supported the world's largest colony of Nile Crocodile, but recent field observations suggest the crocodile population is a fraction its former size, likely due to increasing anthropogenic pressures (IUCN World Heritage Outlook 2020). The lake is rich in fish (47 species; Birdlife International 2022). In addition, Lake Turkana is an internationally recognized Important Bird Area (Birdlife International 2022), with 84 water bird species, including 34 Palaearctic migrants, according to the latest available data.

The only known extensive reptile and amphibian survey of the area was conducted by Ziliani et al. (2006). The results were presented at the 6th Congresso Nazionale della Societas Herpetologica Italica in 2006, but have not been formally published other than the abstract of that presentation and a new species description (Sindaco et al. 2007).

The annotated checklist provided here is the result of two six-week herpetological surveys of the SNP conducted in 2016 and 2017. In addition, the species recorded by Ziliani et al. (2006) are included and discussed. The identifications of the new materials collected in the present study were based on the species descriptions and other literature, morphological comparisons using the reference collection at the National Museums of Kenya (NMK) and, in some cases, the advertisement calls of amphibians (S. Kirchhof, unpub. data).

Fig. 2. Representative examples of typical habitats within the surveyed transects in the study area: **(A)** cattle grazing on the grassland transect in KF; **(B)** bushland transect with compact soil and loose rocks and stones in KF; **(C)** overgrazed grassland transect at IL; **(D)** LO bushland transect; **(E)** AB bushland transect; **(F)** dry lagga and adjacent riverine vegetation as part of the KF river transect; **(G)** KA riverbed after rain; and **(H)** section of the IL river transect.

Material and Methods

Two expeditions to SNP were conducted from 7 November 2016 to 11 December 2016 and from 28 March 2017 to 24 April 2017. Three observers sampled a total of five sites across the National Park, three along the Lake Turkana (L) shoreline, i.e., Alia Bay (AB), Koobi Fora (KF), and Ilkemere (IL), and two further inland, i.e., Karare (KA) and Lomosia (LO) (Fig. 1). The LO site was only surveyed in March/April 2017. At each site close to the lake, we walked three transects (one in grassland (G) along the shore, one in bushland (B), and one in a dry riverbed (R); Fig. 2), each with a length of about 800–1,000 m, for 3 hours in the morning from 0800–1100 h and 4 hours in the evening/night from 1700–1900 h and 2100–2300 h, and this pattern was repeated over 2 days for each site. At the inland sites, the same protocol was followed, but the grassland transect was replaced with a second bushland transect. In addition, opportunistic collections were made at the Turkana Basin Institute (TBI) near Illeret. The localities of all individuals of reptiles and amphibians were recorded with a GPS (coordinates in latitude, longitude, datum WGS 1984, in decimal degrees), time of day was documented, and a brief description of the locality was given. When possible, air, substrate/water and cloacal temperatures were recorded and they are reported here. All temperature were taken by means of a K-type thermocouple (B + B Thermotechnik, effective measurement range -50 to +260 °C) connected to a digital thermometer (Center 300) (accuracy ± 0.1% +0.7 °C, resolution 0.1 °C, effective measurement range -200 to +1,370 °C). Body temperatures (T_b) were measured by means of cloacal temperature with the thermocouple inserted 10–15 mm into the animal's cloaca.

Taxonomy follows information from Amphibiaweb (https://amphibiaweb.org), Channing and Howell (2006), Frost (2022), Largen (2001), Uetz et al. (2022), and Spawls et al. (2018, 2019). Selected individuals were collected as voucher specimens; and when necessary, individuals were euthanized using an aqueous solution of benzocaine (20%) injected into the body cavity. After injection, the individuals were measured, a tissue sample (liver or muscle from dissected individuals, tail tips from lizards, a ventral scale clip from snakes, and toe clips from frogs) was taken and transferred to ethanol (96%) for possible future molecular analysis, and the specimen was fixed in 2% formalin. After the expedition, voucher specimens and tissue samples

were accessioned into the herpetology collection at NMK. For each species account, NMK numbers and/or field numbers (for the tissue samples from voucher specimens, the specimen number is used, additional tissue samples without vouchers are listed separately), CITES status (where applicable), and any IUCN Red List status other than Least Concern are provided in the header of each species account.

Results

In total, we recorded 34 species, including six amphibians (Fig. 3) and 28 reptiles comprised of one freshwater turtle, one crocodile, 18 lizards, and eight snakes (Fig. 4). Many taxa in the area currently have multiple subspecies that warrant rigorous revision, so only the binomial names (genus plus species epithet) are used in this list. For each voucher specimen collected and listed here, tissue samples in 96% molecular grade ethanol are available at the NMK, and these samples can be used in future taxonomic analyses.

Species Accounts

Amphibia
Anura
Bufonidae

Lugh Toad
***Poyntonophrynus lughensis* (Loveridge, 1932)**
Vouchers: NMK-A1824 (field no. SK1112)
Localities in the study area (henceforth simply called localities): Turkana Basin Institute (TBI)
Remarks: On 28 March 2017, tens to hundreds of individuals were calling in the late morning (0900–1100 h) together with *Tomopterna wambensis* in a temporary water body created by recent rainfalls in the usually dry bushland in front of the TBI near Illeret. Several pairs of *Poyntonophrynus lughensis* were found in amplexus. One female was collected and accessioned in the NMK collection (Fig. 3A). Similar to other members of the African pygmy toads of this genus, the natural history of *P. lughensis* is almost completely unknown (Ceríaco et al. 2018). Interestingly, in a recent large-scale molecular phylogeny of African toads, *P. lughensis* actually clustered with the species of the genus *Mertensophryne* Tihen, 1960 (Liedtke et al. 2017).

Sub-desert Toad
***Sclerophrys xeros* (Tandy, Tandy, Keith, and Duff-MacKay, 1976)**
Vouchers: NMK-A1817 (field no. SK1118)
Localities: TBI
Remarks: One male was calling on 13 April 2017 in an artificial water reservoir at TBI. This was the only individual we recorded of this widespread species from dry savanna and semi-desert. The specimen (Fig. 3B) showed the bright scarlet vermiculation on the posterior femoral integument typical for *S. xeros*. In addition, the call resembled typical *S. xeros* calls.

Turkana Toad
***Sclerophrys turkanae* (Tandy and Feener, 1985)**
IUCN Red List: Data Deficient
Vouchers: NMK-A1816 (field nos. SK16 1057, SK16 1059, SK16 1060–1064)
Localities: AB (R), KF (G)
Remarks: Endemic to Kenya. This toad (Fig. 3C) was very abundant in the grassland transects along the shores of Lake Turkana, and found in high numbers and different sizes at Alia Bay and Koobi Fora. During the day they were hiding in moist mud cracks, and at night they were on land in slightly flooded grassy plains right at the lake edge. Males were calling in November, and the calls affirmed their identification as *S. turkanae*. According to the latest published amphibian guide (Spawls et al. 2019), this species is only known from Lake Turkana. The IUCN assessment mentions records from two localities in north-central Kenya: Loyangalani [Loiengalani] (south-eastern shores of Lake Turkana), and Uaso Nyiro River in the Samburu Game Reserve (IUCN SSC Amphibian Specialist Group 2016).

Ptychadenidae

Nile Ridged Frog
***Ptychadena nilotica* (Seetzen, 1855)**
Vouchers: NMK-A1818 (field nos. SK16 1045, SK16 1046, SK16 1056, SK16 1058, SK16 1065–1068, SK16 1070, SK16 1097, SK16 1105)
Localities: IL (G), AB (R), KF (G)
Remarks: This species (Fig. 3D) was found in high numbers. Individuals were found at night together with *Sclerophrys turkanae* in flooded grassy plains along the shore of Lake Turkana, but also on the edge of temporarily flooded waterbodies and in the riverbed transects slightly further away from the actual lake shore where *S. turkanae* was mostly absent. When disturbed at the water edge on land, individuals of *P. nilotica* escaped by jumping into the lake, but instead of diving into the water, they rather jumped across the water surface for several meters without sinking before jumping back on land.

Schilluk Ridged Frog
***Ptychadena* cf. *schillukorum* (Werner, 1907)**
Vouchers: NMK-A1825 (field no. SK16 1105)
Localities: IL (R)
Remarks: *Ptychadena schillukorum* currently has a large distribution range across sub-Saharan Africa, from Mauritania to Somalia and south to Angola and Mozambique. The taxonomy of frogs referred to as *P. schillukorum* is unresolved, and this taxon may actually represent a species complex (e.g., Nago et al. 2006). We assigned individual SK16 1105 (Fig. 3E) to *P.* cf. *schillukorum* based on the following features: skin of the flank granular or warty, tympanum-eye diameter ratio about 0.70, both internarial distance and nostril-tip of snout distance less than nostril-eye distance.

A previous record from the Omo River delta in Ethiopia already exists. On the night of 9 December 2016, the sole individual SK16 1105 was found sitting on soft sand in the dry riverbed of an ephemeral river (known as "lagga" or "lagha"), about 1.6 km from the lake shore. In arid lands, this species usually inhabits permanent water bodies such as swamps and springs where they can occur in sympatry with *P. nilotica* (e.g., in Shompole swamp, Magadi, southwestern Kenya) (PK Malonza, pers. obs.). Molecular analyses will help to resolve the taxonomic status of the *P. schillukorum* group.

Pyxicephalidae

Wamba Sand Frog
***Tomopterna wambensis* Wasonga and Channing, 2013**
Vouchers: NMK-1815 (field nos. SK16 1024, SK16 1071, SK16 1084, SK 1111)
Localities: IL (G, R), KA (R), KF (R), LO (R), TBI
Remarks: This medium-sized, stout, semi-fossorial frog was quite common in the study area. Its inner metatarsal tubercle is used for digging into the soil of dry riverbeds in order to reach moister areas and survive droughts, and the outer metatarsal tubercle is absent. It can be further identified by its interrupted glandular ridges below the tympanum.

As soon as a few drops of rain fell – often during the night – the buried individuals of *T. wambensis* (Fig. 3F) appeared on the surface. On 28 March 2017, tens to hundreds of individuals were calling in the late morning (0900–1100 h) together with *Poyntonophrynus lughensis* in a temporary water body created by recent rainfalls in the usually dry bushland in front of the TBI. For one individual, an internal field body temperature (T_b) of 29.4 °C was recorded at an air temperature (T_a) of 30 °C and substrate temperature (T_{sub}) of 21 °C.

Reptilia
Testudines
Trionychidae

Nile Soft-shelled Turtle
***Trionyx triunguis* (Forskål, 1775)**
IUCN Red List: Vulnerable. CITES App. II
Vouchers: None
Localities: KF (B)
Remarks: The carapace of one dead individual of this soft-shell turtle was found about 900 m from the shore of Lake Turkana at Koobi Fora. These turtles are still eaten by the local people around Lake Turkana (V. Wasonga, pers. obs.; Spawls et al. 2018), so we suspect the locality does not reflect the individual's actual habitat. The Nile Soft-shelled Turtle inhabits permanent lakes, dams, and rivers, and is known to enter the sea, but it does not live in any other Kenyan lake in the Great Rift Valley other than Lake Turkana, because none of the other rivers were ever connected to the Nile system (Spawls et al. 2018).

Crocodylia
Crocodylidae

Nile Crocodile
***Crocodylus niloticus* Laurenti, 1768**
CITES App. II
Vouchers: None
Localities: AB (L), IL (L, B), KF (L, G)
Remarks: The Lake Turkana population of Nile Crocodiles used to be the largest in the world (IUCN World Heritage Outlook 2020). Recent data suggests that the crocodiles are heavily impacted by local fishermen who destroy nesting sites, and the remaining population is only a fraction of what it used to be (IUCN World Heritage Outlook 2020). We found *Crocodylus niloticus* in Lake Turkana and adjacent water bodies along the shoreline. Very young juveniles (Fig. 4A) were found in March/April.

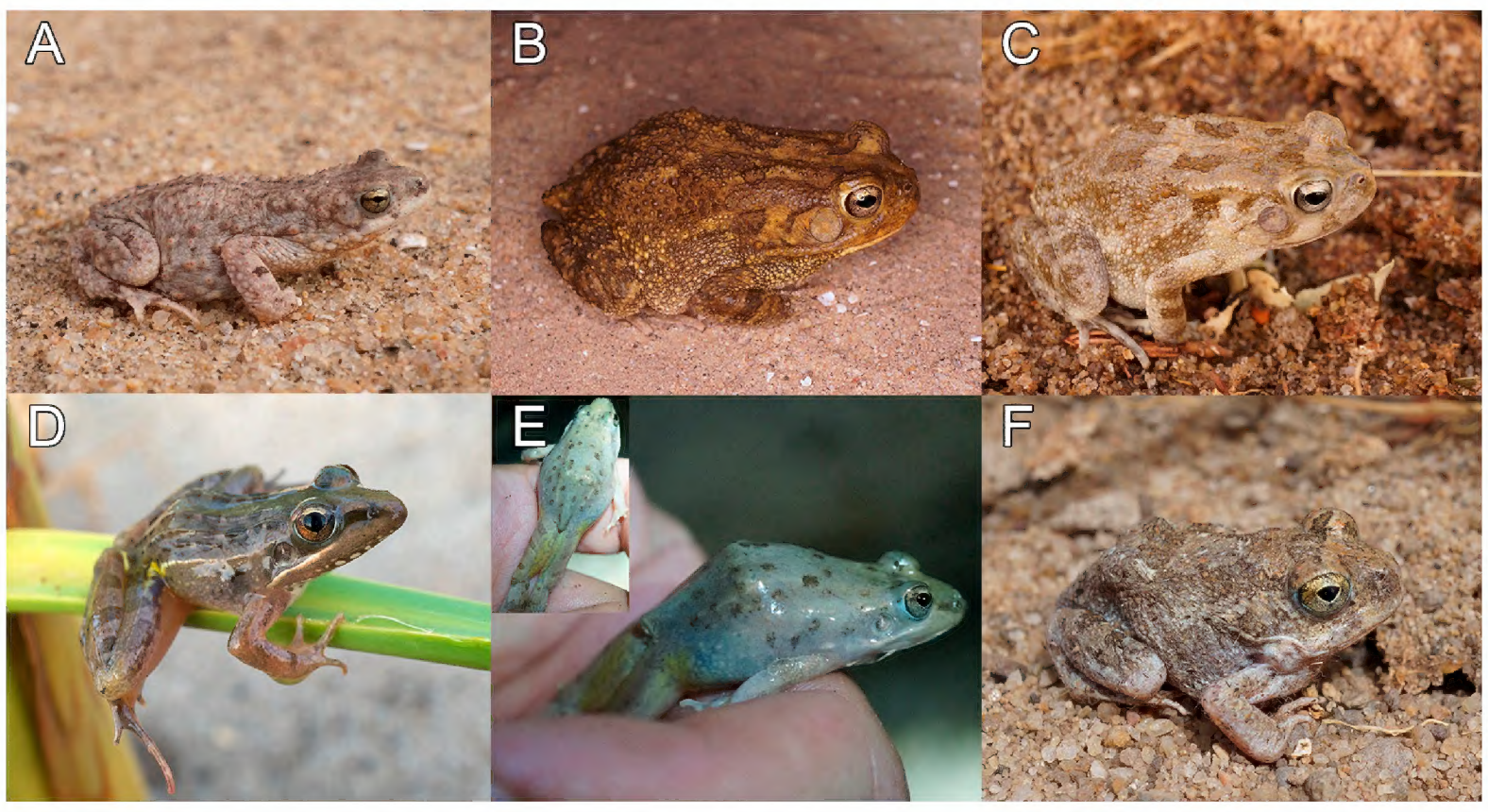

Fig. 3. Amphibian species recorded during the surveys: **(A)** *Poyntonophrynus lughensis*; **(B)** *Sclerophrys xeros*; **(C)** *Sclerophrys turkanae*; **(D)** *Ptychadena nilotica*; **(E)** *Ptychadena* cf. *schillukorum*; and **(F)** *Tomopterna wambensis*.

Squamata
Agamidae

Red-headed Rock Agama
***Agama lionotus* Boulenger, 1896**
Vouchers: NMK-398L/1 (SK16 1038b), 399L/1–2 (field nos. SK16 1114–1115)
Distribution: AB (R), petrified forest
Remarks: The distribution of this taxon is still uncertain in many parts of its range because of possible confusion with *Agama agama* (but not in Kenya), *A. finchi,* and *A. dodomae* (Spawls et al. 2018).

This agama was only found in Alia Bay (three individuals including one juvenile NMK-398L/1 (SK16 1038b)) and in the petrified forest (NMK SK1115). In the absence of rocks, this species was entirely arboreal, living on *Vachellia* sp. trees in the riparian woodlands along the dry riverbeds. Only in the rock-dominated petrified forest site (about 5 km from Karsa Gate, the southern entry point of SNP) was this species rupicolous. We found *Agama lionotus* individuals (Fig. 4B) only between 1800 h and 2100 h. The average T_b was 33.8 ± 1.7 °C (32.6–35 °C; N = 2) with T_{sub} ranging from 30–34 °C and T_a ranging from 32–35 °C.

Rüppell's Agama
***Agama rueppelli* Vaillant, 1882**
Vouchers: NMK-375L/1-4 (field nos. SK16 1042, SK16 1074, SK16 1075, SK16 1094)
Distribution: AB (B), KA (B, R), KF (R), LO (B)
Remarks: This species occurs in dry savannas and semi-deserts in lower elevations (Spawls et al. 2018). We recorded 25 individuals of this strictly terrestrial agama (Fig. 4C) in bushland at all sites except IL. Activity was high during all four study months, and individuals were observed to be active from 0900 h to 2200 h. The average T_b was 31.9 ± 3.0 °C (28.4–36.5 °C; N = 5) with T_{sub} ranging from 24–39 °C and T_a ranging from 27–36 °C.

Eublepharidae

Somali-Maasai Clawed Gecko
***Holodactylus africanus* Boettger, 1893**
Vouchers: NMK-390L/1–3 (field nos. SK16 1080, SK16 1081, SK16 1083)
Distribution: KA (R), IL (R), TBI
Remarks: Very little is known about this nocturnal terrestrial eyelid gecko and only occasional records exist. It is assumed to occur throughout dry savannas and semi-deserts from southeastern Ethiopia, northern Somalia through Kenya and into northeastern Tanzania at low elevations of 200–1,000 m (Spawls et al. 2018). We found seven individuals in November, December, and April in dry sandy river beds at KA and at TBI near the water reservoir. The species' occurrence seems to be associated with high groundwater and/or dense vegetation as all individuals were found at night in the riverbed at the edge of the vegetated slope. Three different color morphs were found, including yellowish, slightly pink, and darker brown (Fig. 4D). These are the first Kenyan records from the eastern side of Lake Turkana.

Gekkonidae

East African House Gecko
***Hemidactylus angulatus* Hallowell, 1852**
Vouchers: NMK-380L/1–3 (field nos. SK16 1110, SK 1116, SK16 1055)
Localities: KF (B), TBI, petrified forest
Remarks: This is a fairly large gecko that is widespread in Kenya, occurring south to Tanzania, north to Sudan and west to Senegal, and occupying a variety of dry and mesic habitats (Spawls et al. 2018). It can be distinguished from *H. ruspolii* and other *Hemidactylus* by small granules covering the upper surface of the snout rather than large and keeled granules, heterogeneous dorsal scales with small granular scales interspersed with rows of large, keeled, and mainly oval tubercles, and males with a series of 20–46 preano-femoral pores interrupted mid-ventrally (Fig. 4E). Three individuals were found over the course of our study, and all of them were associated with rocks or anthropogenic structures/houses. This taxon might actually represent a species complex (the type locality is in Gabon), and extensive molecular analyses are necessary to resolve its status. One gravid female carrying eggs was collected on 7 April 2017.

Barbieri's Turkana Gecko
***Hemidactylus barbierii* Sindaco, Razzetti, and Ziliani, 2007**
Vouchers: NMK-378L/1–4 (field nos. SK16 1078, SK16 1085–1087)
Distribution: KA (R)
Remarks: Four individuals were found at KA (about 15 km inland of Lake Turkana) at about 514 m elevation. These represent the first records from the eastern side of Lake Turkana (Sindaco et al. 2007). This species can be distinguished from the syntopic *Hemidactylus ruspolii* Boulenger, 1896 by the presence of precloacal pores in males (instead of femoral pores), and a dorsal pattern consisting of four transverse dark grey (or at least bordered with dark grey margins) bands (one nuchal and three between anterior and posterior limbs), and a dark rather narrow crescent shaped band bordering the posterior skull margins and extending through the eyes to the nostril (more pronounced in the yellow and black juveniles; Fig 4F). It is different from *Hemidactylus bavazzanoi* Lanza, 1978 in the mental scale arrangement as well as the dorsal pattern, which in *H. bavazzanoi* comprises only three dark transverse bands and a broader crescent shaped head band. Little is known about the ecology of *H. barbierii*. It is usually considered to be terrestrial, hiding under ground coverings or in holes (Sindaco et al. 2007; Spawls et al. 2018). Based on our observations, we consider it to be arboreal rather than terrestrial. This species inhabits the riparian woodlands along dry laggas where individuals were found actively foraging at night on the tree stems and at the bases of trees. All individuals escaped by fleeing up the trees rather than running away on the ground. One recently hatched individual (Fig. 4F) was found during the day hiding under the bark of a *Vachellia* sp. tree at about 1.8 m above the ground on 29 November 2019.

Fig. 4. Reptile species recorded during the surveys: **(A)** *Crocodylus niloticus*; **(B)** *Agama lionotus*; **(C)** *Agama rueppelli*; **(D)** *Holodactylus africanus*; **(E)** *Hemidactylus angulatus*; **(F)** *Hemidactylus barbierii*; **(G)** *Hemidactylus lanzai*; **(H)** *Hemidactylus ruspolii*; **(I)** *Homopholis fasciata*; **(J)** *Lygodactylus somalicus*; **(K)** *Stenodactylus sthenodactylus*; **(L)** *Heliobolus spekii*; **(M)** *Latastia longicaudata*; **(N)** *Philochortus rudolfensis*; **(O)** *Chalcides bottegi*; **(P)** *Mochlus sundevallii*; **(Q)** *Trachylepis striata*; **(R)** *Varanus albigularis*; **(S)** *Eryx colubrinus*; **(T)** *Platyceps brevis*; **(U)** *Psammophis* cf. *tanganicus*; **(V)** *Psammophis punctulatus*; **(W)** *Rhamphiophis rostratus*; **(X)** *Naja pallida*; **(Y)** *Bitis arietans*; and **(Z)** *Echis pyramidum*.

So far, this species is only known from the Lake Turkana region. The type series was collected south of KF, 10 km inland from AB (Sindaco et al. 2007).

Lanza's Gecko
***Hemidactylus lanzai* Šmíd, Mazuch, Nováková, Modrý, Malonza, Elmi, Carranza, and Moravec, 2020 et al. 2020**
Vouchers: NMK-391L (field no. SK16 1021); NMK-383L/1–2 (field nos. SK16 1029, SK16 1033); NMK-395L (field no. SK16 1039); NMK-392L (field no. SK16 1053); NMK-393L (field no. SK16 1037)
Additional tissue samples: SK105 2016
Localities: AB (R), IL (R, G, B), KA (R, B), KF (R, G), LO (R)
Remarks: Recently elevated to a full species from the synonymy of its sister species *Hemidactylus isolepis* Boulenger, 1895, this small, terrestrial gecko is a typical inhabitant of the dry, semi-desert areas in northern Kenya (Spawls et al. 2018). This species (Fig. 4G) was one of the most common reptiles in SNP, with 96 individuals recorded. The highest abundance was along the shores of Lake Turkana, where individuals were hiding in the root system under dried reeds, but it also was found in dry laggas and bushland under dead logs, trees, and rocks. It was exclusively active at night, foraging on sand, gravel, and compact soils. The average T_b was 34.0 ± 1.5 °C (30.5–35.8 °C; N = 10) with T_{sub} ranging from 24–47 °C and T_a ranging from 28–38 °C.

Prince Ruspoli's Gecko
***Hemidactylus ruspolii* Boulenger, 1896**
Vouchers: NMK-377L/1–11 (field nos. SK16 1026, SK16 1028, SK16 1032, SK16 1040, SK16 1044, SK16 1054, SK16 1073, SK16 1089)
Localities: AB (R), IL (B, R), KA, (B, R), KF (B, R)
Remarks: This medium-sized gecko (Fig. 4H) is less widespread in East Africa and inhabits drier and lower areas in Kenya, Somalia, and Ethiopia compared to its relative *H. angulatus*. This species was quite abundant in the riverbeds of SNP were we often found it at night under bark, foraging along tree stems, and at the foot of trees. A few individuals were also found in bushland on *Salvadora persica* ("toothbrush tree"). Average T_b was 32.3 ± 1.0 °C (30.5–34.1 °C; N = 12) with T_{sub} ranging from 25–33 °C and T_a ranging from 29–34 °C.

Banded Velvet Gecko
***Homopholis fasciata* (Boulenger, 1890)**
Vouchers: NMK-386L/1–2 (field nos. SK16 1095, SK16 1103)
Localities: AB (R), IL (R), KA (B), LO (R)
Remarks: The strictly arboreal Banded Velvet Gecko (Fig. 4I) is a savanna species that typically occupies holes and crevices in large trees from sea level to at least 1,300 m (Spawls et al. 2018). In SNP, we found six individuals in December, March, and April. Individuals were found under bark and in holes of *Vachellia* sp., as well as on the much smaller and bush-like *Salvadora persica*. A gravid female was collected on 30 March 2017. The average T_b was 35 ± 0 °C (N = 2) with T_{sub} ranging from 33–34 °C and T_a ranging from 34–35 °C. These are the first Kenyan records from the eastern side of Lake Turkana.

Somali Dwarf Gecko
***Lygodactylus somalicus* Loveridge, 1935**
Vouchers: NMK-387L/1–3 (field nos. SK16 1072, SK16 1101, SK16 1104)
Additional tissue samples: SK278 2016
Localities: IL (R, B), KF (R)
Remarks: This arboreal species is a typical inhabitant of dry savannas and semi-deserts. During our surveys, 39 individuals of this small diurnal gecko (Fig. 4J) were recorded in IL (N = 35) and KF (N = 4), in both bushland and in dry riverbeds on small trees and shrubs (the majority on *Salvadora persica*, but also on *Vachellia* sp.).

Elegant Gecko
***Stenodactylus sthenodactylus* (Lichtenstein, 1823)**
Vouchers: NMK-396L/1–3 (field nos. SK16 1022, SK16 1030, SK16 1031)
Additional tissue samples: SK084 2016, SK120 2016, SK117 2016
Localities: AB (R, B), IL (R, B, G), KA (B), KF (R, B, G), LO (B)
Remarks: This widespread nocturnal, terrestrial gecko (Fig. 4K) is known from semi-deserts and deserts across its range, but in Kenya it has only been recorded in the Lake Turkana vicinity. It was very common in the study area, with 75 individuals recorded. All individuals were found on the ground (sand, gravel, often under shrubs) in the evening and at night (1900 h to 2300 h). The average T_b was 32.4 ± 2.2 °C (25.8–35 °C; N = 20) with T_{sub} ranging from 23–33 °C and T_a ranging from 27–35 °C.

Lacertidae

Speke's Sand Lizard
***Heliobolus spekii* (Günther, 1872)**
Vouchers: NMK-376L/1–3 (field nos. SK16 1076, SK16 1082, SK16 1088)
Additional tissue samples: SK351 2017, SK468 2017, SK469 2017, SK478 2017, SK479 2017
Localities: KA (B, R), LO (B), TBI
Remarks: *Heliobolus spekii* (Fig. 4L) is a widespread generalist species inhabiting coastal thicket and woodland, moist and dry savanna, and semi-desert at elevations from sea level to 1,500 m (Spawls et al. 2018). We found 18 individuals throughout the study period. This species was absent from the sites near the lake shore and from sparsely vegetated areas. It was only found further inland at the Karare site, Lomosia, and at TBI in more densely vegetated, grassy bushland and on vegetated riverbanks. One pair was observed mating on 17 April 2017. The average T_b was high at 37.5 ± 1.4 °C (34.5–39 °C; N = 8) at substrate temperatures (T_{sub}) ranging from 28–49 °C and T_a ranging from 29–34 °C.

Long-tailed Sand Lizard
***Latastia longicaudata* Reuss, 1834**
Vouchers: NMK-388L (field no. SK16 1027); NMK-385L (field no. SK1034); NMK-384L (field no. SK1050)
Additional tissue samples: SK110.1 2016, SK142 2016, SK158 2016, SK195 2016, SK233 2016, SK295 2017, SK303 2017, SK305 2017, SK306 2017, SK352 2017, SK481 2017

Localities: AB (R, B, G), IL (R, B, G), KA (R, B), KF (R, B), LO (R, B)
Remarks: We recorded 33 individuals of this common diurnal lacertid (Fig. 4M) throughout the study period on all transects between 0800 h and 1930 h. All lizards were darting between bushes in search of prey and places for hiding. Average T_b was high at 37.8 ± 1.2 °C (36.2–39.5 °C; N = 8) at T_{sub} ranging from 31–65 °C and T_a ranging from 33–39 °C. The genus *Latastia* consists of multiple similar-looking species and subspecies, and in some cases, only the suspected distribution range allows for identification. Rigorous genetic analysis is necessary to update the taxonomic status, the distinguishing morphological character traits, and the distribution ranges of existing specimens.

Turkana Shield-backed Ground Lizard
***Philochortus rudolfensis* Parker, 1932**
Vouchers: NMK-382L/1–2 (field nos. SK16 1048, SK89 2016)
Localities: AB (B)
Remarks: Only a limited number of records exist for this species, and its exact range is therefore unknown – it is currently known from southern Ethiopia and northern and central Kenya, at elevations below 800 m (Spawls et al. 2018). During our survey, we found two individuals (Fig. 4N) in a very dry and overgrazed area of the AB bushland on compacted but not rocky substrate in the late mornings of 15 and 16 November 2016. On the same transect, *Agama rueppelli, Latastia longicaudata, Rhamphiophis rostrastus, Stenodactylus sthenodactylus*, and *Trachylepis striata* were also recorded.

Scincidae

Ocellated Skink
***Chalcides bottegi* Boulenger, 1898**
Vouchers: NMK-389L (field no. SK16 1092)
Localities: KA (B), KF (G)
Remarks: This skink (Fig. 4O) is known from dry savanna and semi-desert in northern Kenya. We found only two individuals of this semi-fossorial skink in KA and KF in grassland and bushland, respectively. Both individuals were active during the day, one was found under dead reeds along the lake shore, and the other was digging into the loose sand under a *Commiphora africana* shrub. The body temperature of the individual under the reed was 34.9 °C at a substrate temperature of 34 °C (T_a 37.5 °C). These are the first Kenyan records from the eastern side of Lake Turkana.

Sundevall's Writhing Skink
***Mochlus sundevallii* (Smith, 1849)**
Vouchers: NMK-397L/1–4 (field nos. SK16 1035, SK16 1077, SK16 1090, SK16 1106)
Additional tissue samples: SK281 2016
Localities: IL (B, R), KA (R), KF (R, B, G), LO (B)
Remarks: A nocturnal, fossorial species that occupies a variety of habitats comprising coastal savanna and woodland, dry and moist savanna, semi-desert, and medium to high-elevation woodland up to 2,000 m (Spawls et al. 2018). Seventeen individuals of *Mochlus sundevallii* (Fig. 4P) were found, all after sunset, digging in soft sand under shrubs. Average T_b was 33.9 ± 1.0 °C (32.7–34.9 °C; N = 4) at T_{sub} ranging from 29–30 °C and T_a ranged from 32–35 °C.

Striped Skink
***Trachylepis striata* (Peters, 1844)**
Vouchers: NMK-379L/1–5 (field nos. SK16 1036, SK16 1041, SK16 1052, SK16 1069, SK16 1107)
Localities: AB (B, L), IL (B), KA (B), KF (G)
Remarks: A recent study found *Trachylepis striata* (Fig. 4Q) to be paraphyletic, with Ethiopian individuals being the sister group to Tanzanian individuals and *T. mlanjensis* (Loveridge, 1953) from Malawi (Weinell et al. 2019). Kenyan specimens were not included in that study. Extensive molecular analyses of individuals covering the distribution ranges of these taxa will be necessary to resolve their respective status. For now, *Trachylepis striata* is considered a generalist skink, living in forest clearings, coastal thicket, moist and dry savanna, semi-desert, and urban areas (Spawls et al. 2018).

The 14 individuals of a diurnal skink found during this study were assigned to *T. striata* sensu lato. All individuals were discovered on the ground, although this species has been referred to as arboreal (Spawls et al. 2018). The majority of individuals were found under clumps of dead reeds along the lake shore. Average T_b was 34.7 ± 0.4 °C (34.4–35 °C; N = 2) at T_{sub} ranging from 34–40 °C and T_a was 34 °C.

Varanidae

Savannah Monitor
***Varanus albigularis* Daudin, 1802**
CITES App. II
Vouchers: NMK-381L (field no. SK16 1108)
Localities: IL (R), AB (R)
Remarks: This monitor lizard is quite widespread across Africa and occupies different habitats from dry and moist savanna, coastal thicket and woodland, and semi-desert, from sea level to 1,500 m elevation (Spawls et al. 2018). It likely occurs across most of Kenya, but museum specimens are scarce. The records of the rock or White-Throated Monitor represent the first records for the eastern shore of Lake Turkana, although there was hardly any doubt the species occurred there. Three individuals were found in December and April, comprising one adult and two juveniles. The two juveniles (Fig. 4R) were found at night sleeping on tree branches, one was exposed just lying atop the branch at 2 m height, and one was hidden under bark close to the ground. The adult individual was found in the morning under the bark of a tree stem.

Nile Monitor
***Varanus niloticus* (Linnaeus, 1766)**
CITES App. II
Vouchers: None
Localities: IL (G)
Remarks: The most widespread African lizard usually lives near fresh water sources from sea level to around 1,600 m elevation, and rarely higher. We observed one individual Nile Monitor walking along the shore of Lake

Turkana in the early afternoon in December 2016. This species might be under threat in some parts of Africa, as it is exploited for its skin, particularly in West Africa, but the proliferation of dams has provided extra habitat for this species (Spawls et al. 2018). It is probably quite common in SNP.

Serpentes
Boidae

Kenya Sand Boa
***Eryx colubrinus* (Linnaeus, 1758)**
CITES App. II
Vouchers: NMK-372S (field no. SK16 1023)
Additional tissue samples: SK353 2017
Localities: AB (B), IL (B, R), KF (B), LO (B), TBI
Remarks: A typical inhabitant of arid and semi-arid areas in north-eastern Africa (Spawls et al. 2018). The natural history of the Sand Boa (Fig. 4S) is poorly known due to its secretive fossorial lifestyle. We recorded seven individuals. Six of them were active at night or at least after sunset, and the other one recorded during daytime was found at TBI at noon after rain. It was a large female that was lying under a tree in the moist soil with its head buried underground and its entire body exposed; however, it was largely protected from direct sun by the shadow of the tree. Individuals were recorded in November, March, and April mainly in bushland, and only one individual was found in a dry riverbed.

Colubridae

Smith's Racer
***Platyceps brevis* (Boulenger, 1895)**
Vouchers: NMK-373S (field no. SK16 1049)
Localities: AB (house wall)
Remarks: This racer occupies dry savanna and semi-desert at elevations spanning 100–1,300 m (Spawls et al. 2018). In the early afternoon (1400 h) of 16 November 2016, we collected a specimen of this species (Fig. 4T) coming out of a crevice in the wall of one of the buildings in the Alia Bay grasslands. Only limited information is known about this species and records are still sparse, leading to a fragmented currently-known distribution range (Spawls et al. 2018).

Psammophiidae

Tanganyika Sand Snake
***Psammophis* cf. *tanganicus* Loveridge, 1940**
Vouchers: NMK-370S (field no. SK16 1093)
Records: KA (B)
Remarks: A slim grey sand snake very similar to *Psammophis biseriatus,* of which it was originally described as a subspecies. Its taxonomic status will remain unresolved without thorough genetic and morphological analyses covering their entire ranges. According to Loveridge (1940) the only character separating *P. biseriatus biseriatus* from *P. b. tanganicus* [sic] is the number of labial scales entering the orbit (two in *P. b. biseriatus* vs. three in *P. b. tanganicus* [sic]). Specimen NMK-370S has nine labials and the 4th, 5th, and 6th are in contact with the orbit. Labials are not plain white but rather largely blotched in light brown. This poorly known snake occurs from sea level to about 1,300 m in dry savanna and semi-desert, but the known Kenyan records are few and very scattered (Spawls et al. 2018). We found only one individual (Fig. 4U) in the bushland at Karare in the evening of 2 December 2016 right at sunset. It was actively moving on the ground, but immediately climbed into a shrub when disturbed. If the specimen proves to be *P. tanganicus* this will be the first record from the Lake Turkana area. Genetic analyses are necessary to resolve the taxonomic status of *P. biseriatus* and *P. tanganicus*.

Speckled Sand Snake
***Psammophis punctulatus* Duméril, Bibron, and Duméril, 1854**
Vouchers: NMK-S4604 (field no. SK1113)
Records: AB (R), KF (museum headquarters)
Remarks: This common diurnal snake is widely distributed. We found one adult and one juvenile individual in Koobi Fora and Alia Bay in the vegetation along the riverbed and in the Koobi Fora camp, both in April. The large adult individual (Fig. 4V) was feeding on a weaver bird when found (Kirchhof et al. 2018). The currently accepted subspecies *P. p. punctulatus* and *P. p. trivirgatus* (to which the SNP specimens were assigned) seem to be parapatric and morphologically distinguishable, and they might both prove to be full species in the future.

Rufous Beaked Snake
***Rhamphiophis rostratus* Peters, 1854**
Vouchers: NMK-368S (field no. SK16 1051)
Localities: AB (B)
Remarks: This diurnal snake inhabits semi-desert, dry and moist savanna, coastal thicket, and woodland up to 1,500 m (Spawls et al. 2018). We recorded this large terrestrial snake only once (Fig. 4W) in bushland at Alia Bay in November 2016 at night.

Elapidae

Red Spitting Cobra
***Naja pallida* Boulenger, 1896**
Vouchers: NMK-367S (field no. SK16 1047)
Localities: KA (R), KF (G, R)
Remarks: This spitting cobra is another typical occupant of semi-deserts and dry savannas (Spawls et al. 2018). In November 2016, we found three individuals of the gray-phased *Naja pallida* (Fig. 4X). All were active after sunset at Koobi Fora and Karare. One was found in grassland near the lake shore, and the other two were foraging in dry riverbeds.

Viperidae

Puff Adder
***Bitis arietans* (Merrem, 1820)**
Vouchers: NMK-369S (field no. SK16 1102)
Localities: IL (R)
Remarks: We recorded one individual (Fig. 4Y) of this large and widely distributed viper at night in December 2016 among the *Vachellia* sp. trees in a dry riverbed.

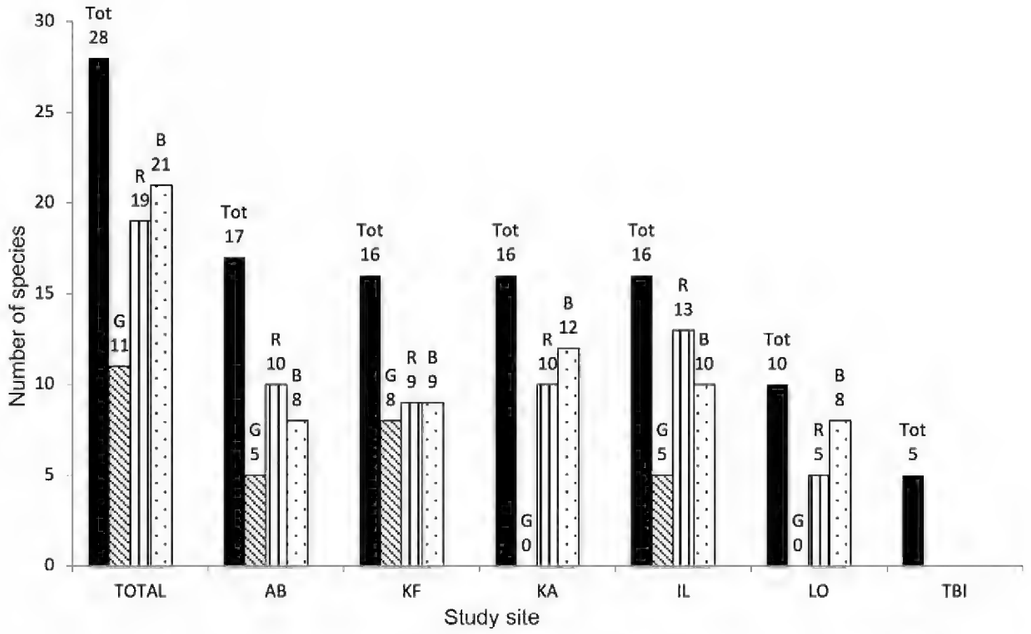

Fig. 5. Occurrence of the 28 recorded reptile species across the survey sites (AB, Alia Bay; KF, Koobi Fora; KA, Karare; IL, Ilkemere; LO, Lomosia; TBI, Turkana Basin Institute) and by transect (G, grassland; R, riverbed; B, bushland; Tot, Total).

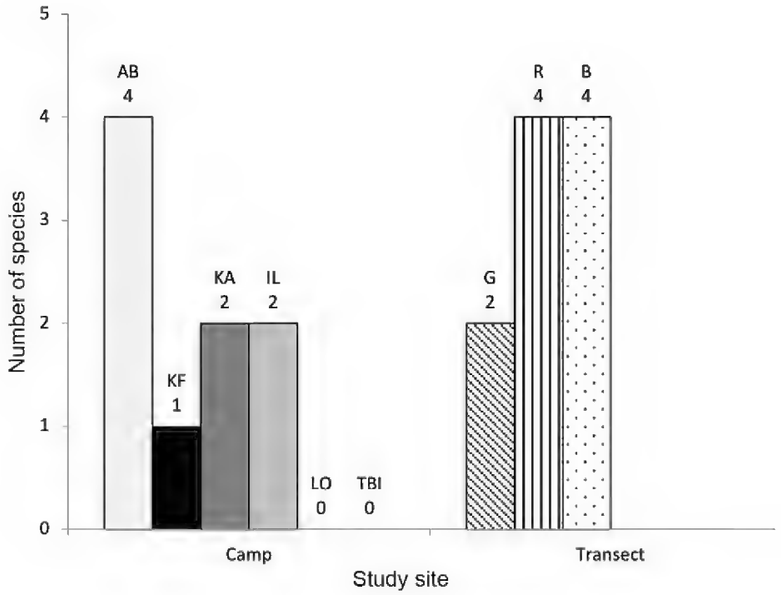

Fig. 6. Numbers of reptile species that were exclusively found at either one of the surveyed sites or one of the transects. Abbreviations: AB, Alia Bay; KF, Koobi Fora; KA, Karare; IL, Ilkemere; LO, Lomosia; TBI, Turkana Basin Institute; G, grassland; R, riverbed; B, bushland; Tot, Total.

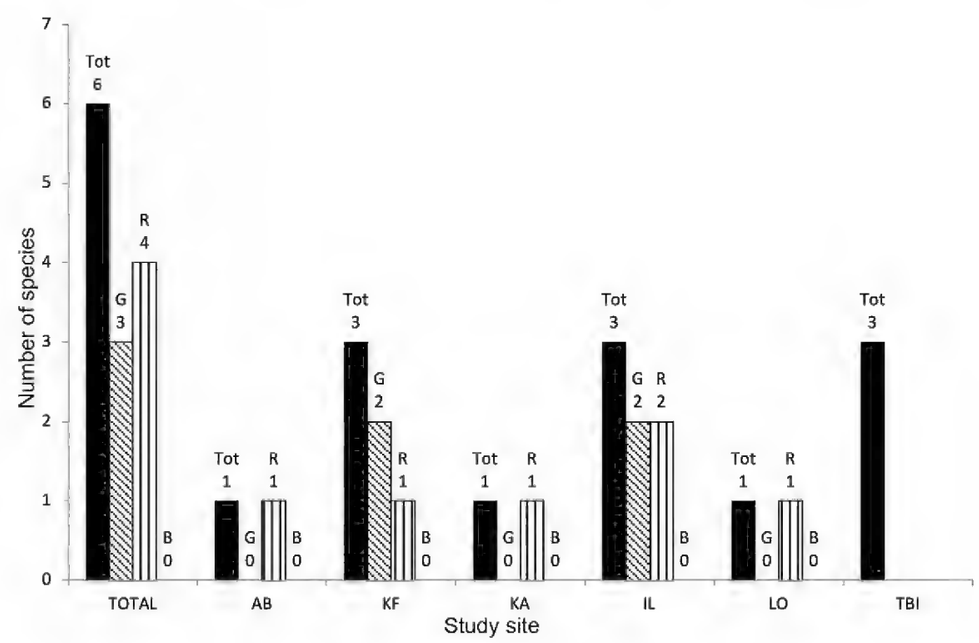

Fig. 7. Occurrence of the six recorded amphibian species across the survey sites (AB, Alia Bay; KF, Koobi Fora; KA, Karare; IL, Ilkemere; LO, Lomosia) and transects (G, grassland; R, riverbed; B, bushland; Tot, Total).

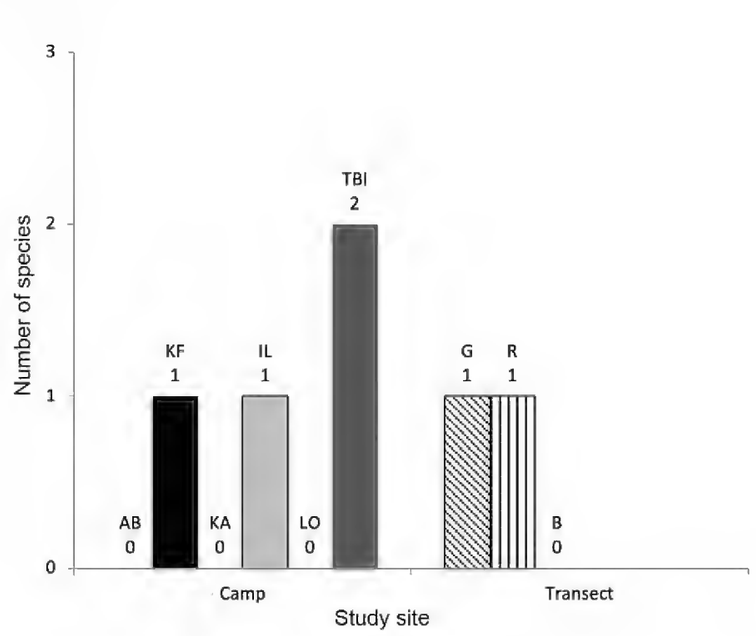

Fig. 8. Numbers of amphibian species that were exclusively found at either one of the surveyed sites or one of the transects. Abbreviations: AB, Alia Bay; KF, Koobi Fora; KA, Karare; IL, Ilkemere; LO, Lomosia; G, grassland; R, riverbed; B, bushland; Tot, Total.

Table 1. List of the amphibian and reptile taxa recorded at Sibiloi National Park, and additional sites along the eastern shore of Lake Turkana south to Mount Kulal, during the present study and from Ziliani et al. (2016). The list does not include *Psammophis semivariegatus,* which is listed by Ziliani et al. (2006), as this taxon does not exist. We assume that this name refers to *Philothamnus semivariegatus* (Smith, 1840) which was listed as *Philothamus semivariegatus*. We here use the species names as used in Ziliani et al. (2016). Some of these names have undergone taxonomic changes by now, for others we could not find out which taxon was referred to (indicated with (?)), and sometimes the taxon name was misspelled (indicated with [sic]).

	This study	**Ziliani et al. (2006)***
AMPHIBIA		
Bufonidae		
Poyntonophrynus lughensis (Loveridge, 1932)	x	*Bufo lughensis*
Sclerophrys xeros (Tandy, Tandy, Keith, and Duff-MacKay, 1976)	x	–
Sclerophrys turkanae (Tandy and Feener, 1985)	x	*Bufo turkanae*
Sclerophrys cf. *gutturalis* (Power, 1927)	–	*Bufo* cf. *gutturalis* (Mt. Kulal)
Ptychadenidae		
Ptychadena nilotica (Seetzen, 1855)	x	*Ptychadena mascareniensis* (?)
Ptychadena anchietae (Bocage, 1868)	–	*Ptychadena anchietae*
Ptychadena cf. *schillukorum* (Werner, 1907)	x	–
Ptychadena cf. *taenioscelis* Laurent, 1954	–	*Ptychadena* cf. *taenioscelis*
Pyxicephalidae		
Tomopterna wambensis Wasonga and Channing, 2013	x	*Tomopterna cryptotis* (?)
REPTILIA		
Pelomedusidae		
Pelomedusa neumanni Petzold, Vargas-Ramírez, Kehlmaier, Vamberger, Branch, Du Preez, Hofmeyr, Meyer, Schleicher, Široký, and Fritz, 2014	–	*Pelomedusa subrufa*
Pelusios broadleyi Bour, 1986	–	*Pelusios broadleyi*
Testudinidae		
Malacochersus tornieri (Siebenrock, 1903)	–	*Malacochersus tornieri* (Mt. Kulal)
Trionychidae		
Trionyx triunguis (Forskål, 1775)	x	*Trionyx triunguis*
Crocodylidae		
Crocodylus niloticus Laurenti, 1768	x	*Crocodylus niloticus*
Agamidae		
Agama lionotus Boulenger, 1896	x	*Agama agama lionotus*
Agama rueppelli Vaillant, 1882	x	*Agama rueppelli*
Chamaeleonidae		
Trioceros bitaeniatus (Fischer, 1884)	–	*Chamaeleo bitaeniatus* (Mt. Kulal)
Trioceros narraioca (Necas, Modrý, and Šlapeta, 2003)	–	*Chamaeleo narrayioca* [sic] (Mt. Kulal)
Eublepharidae		
Holodactylus africanus Boettger, 1893	x	–
Gekkonidae		
Hemidactylus angulatus Hallowell, 1852	x	*Hemidactylus brooki* (?)
Hemidactylus barbierii Sindaco, Razzetti, and Ziliani, 2007	x	*Hemidactylus* n. sp.
Hemidactylus lanzai Šmíd, Mazuch, Nováková, Modrý, Malonza, Elmi, Carranza, and Moravec, 2020	x	*Hemidactylus isolepis*
Hemidactylus macropholis Boulenger, 1896	–	*Hemidactylus macropholis*
Hemidactylus platycephalus Peters, 1854	–	*Hemidactylus platycephalus*

Table 1 Continued. List of the amphibian and reptile taxa recorded at Sibiloi National Park, and additional sites along the eastern shore of Lake Turkana south to Mount Kulal, during the present study and from Ziliani et al. (2016). The list does not include *Psammophis semivariegatus,* which is listed by Ziliani et al. (2006), as this taxon does not exist. We assume that this name refers to *Philothamnus semivariegatus* (Smith, 1840) which was listed as *Philothamus semivariegatus*. We here use the species names as used in Ziliani et al. (2016). Some of these names have undergone taxonomic changes by now, for others we could not find out which taxon was referred to (indicated with (?)), and sometimes the taxon name was misspelled (indicated with [sic]).

	This study	**Ziliani et al. (2006)***
Hemidactylus ruspolii Boulenger, 1896	x	*Hemidactylus ruspolii*
Homopholis fasciata (Boulenger, 1890)	x	–
Lygodactylus keniensis Parker, 1936	–	*Lygodactylus kenyensis* [sic]
Lygodactylus somalicus Loveridge, 1935	x	*Lygodactylus* cf. *somalicus*
Stenodactylus sthenodactylus (Lichtenstein, 1823)	x	*Stenodactylus sthenodactylus*
Gerrhosauridae		
Gerrhosaurus flavigularis Wiegmann, 1828	–	*Gerrhosaurus flavigularis* (Mt. Kulal)
Lacertidae		
Heliobolus spekii (Günther, 1872)	x	*Heliobolus spekii*
Latastia longicaudata Reuss, 1834	x	*Latastia longicaudata*
Philochortus rudolfensis Parker, 1932	x	–
Pseuderemias smithi (Boulenger, 1895)	–	*Pseuderemias smithi*
Scincidae		
Panaspis sp.	–	*Afroblepharus* sp.
Chalcides bottegi Boulenger, 1898	x	*Chalcides ocellatus bottegi*
Mochlus sundevallii (Smith, 1849)	x	*Lygosoma sundevalli* [sic] and *Lygosoma afrum* (Mt. Kulal)
Trachylepis quinquetaeniata (Lichtenstein, 1823)	–	*Mabuya quinquetaeniata*
Trachylepis striata (Peters, 1844)	x	*Mabuya striata*
Trachylepis varia (Peters, 1867)	–	*Mabuya varia*
Varanidae		
Varanus albigularis Daudin, 1802.	x	–
Varanus niloticus (Linnaeus, 1766)	x	–
Atractaspididae		
Aparallactus lunulatus (Peters, 1854)	–	*Apparalactus lunulatus* [sic] (Mt. Kulal)
Boidae		
Eryx colubrinus (Linnaeus, 1758)	x	*Eryx colubrinus*
Colubridae		
Crotaphopeltis hotamboeia (Laurenti, 1768)	–	*Crotaphopeltis hotamboeia* (Mt. Kulal)
Dasypeltis scabra (Linnaeus, 1758)	–	*Dasypeltis scabra* (Mt. Kulal)
Dispholidus typus (Smith, 1829)	–	*Dispholidus typus* (Mt. Kulal)
Philothamnus semivariegatus (Smith, 1840)	–	*Philothamus semivariegatus* [sic] (Mt. Kulal)
Platyceps brevis (Boulenger, 1895)	x	*Platyceps brevis smithi*
Platyceps florulentus (Geoffroy Saint-Hilaire, 1827)	–	*Platyceps florulentus florulentus*
Telescopus obtusus (Reuss, 1834)	–	*Telescopus dhara*
Elapidae		
Naja haje (Linnaeus, 1758)	–	*Naja haie* [sic] (Mt. Kulal)
Naja pallida Boulenger, 1896	x	*Naja pallida*

Table 1 Continued. List of the amphibian and reptile taxa recorded at Sibiloi National Park, and additional sites along the eastern shore of Lake Turkana south to Mount Kulal, during the present study and from Ziliani et al. (2016). The list does not include *Psammophis semivariegatus,* which is listed by Ziliani et al. (2006), as this taxon does not exist. We assume that this name refers to *Philothamnus semivariegatus* (Smith, 1840) which was listed as *Philothamus semivariegatus*. We here use the species names as used in Ziliani et al. (2016). Some of these names have undergone taxonomic changes by now, for others we could not find out which taxon was referred to (indicated with (?)), and sometimes the taxon name was misspelled (indicated with [sic]).

	This study	Ziliani et al. (2006)*
Lamprophiidae		
Boaedon fuliginosus (Boie, 1827)	–	*Lamprophis fuliginosus* (Mt. Kulal)
Lycophidion sp.	–	*Lycophidion* sp. (Mt. Kulal)
Leptotyphlopidae		
Myriopholis macrorhyncha (Jan, 1860)	–	*Leptotyphlops machrorhynchus*
Psammophiidae		
Psammophis biseriatus (Peters, 1881)	–	*Psammophis biseriatus* (Mt. Kulal)
Psammophis punctulatus Duméril, Bibron, and Duméril, 1854	x	*Psammophis* cf. *punctulatus*
Psammophis cf. *tanganicus* Loveridge, 1940	x	–
Rhamphiophis rostratus Peters, 1854	x	–
Rhamphiophis rubropunctatus (Fischer, 1884)		*Rhamphiophis rubropunctatus*
Viperidae		
Bitis arietans (Merrem, 1820)	x	*Bitis arietans*
Echis pyramidum (Geoffroy Saint-Hilaire, 1827)	x	*Echis pyramidum*

North-east African Carpet Viper
***Echis pyramidum* (Geoffroy Saint-Hilaire, 1827)**
Vouchers: NMK-374S (field no. SK16 1025); NMK-371S (field no. SK16 1149)
Additional tissue samples: SK051 2016
Localities: AB (B, R), IL (B, R), KA (B), KF (B, G, R), LO (R)
Remarks: The most common snake in SNP during our expeditions was *Echis pyramidum*, with 38 individuals recorded. This species (Fig. 4Z) occurred at all our study sites and in all transect types, but with a predilection for bushland (26 records). Activity was restricted to the night time, and records during daytime were exclusively of resting individuals dug out under dead logs.

Camp and Transect Comparisons

Of the 28 reptile species, 11 were recorded in the grasslands along the lake shore (of those, *P. brevis* was not recorded in natural habitat but on the wall of a building), 19 in the dry riverbeds, and 21 in bushland. The species diversity of the different sites were very similar (16–17 species per site) when the sites with similar collecting effort were compared, i.e., Lomosia with 10 species was only surveyed in March–April 2017, and species at TBI were recorded opportunistically (Fig. 5). The species found only at one site comprised four at Alia Bay (*Agama lionotus, Philochortus rudolfensis, Platyceps brevis, Rhamphiophis rostratus*), one species at Koobi Fora (*Trionyx triunguis*), two species at Karare (*Hemidactylus barbierii, Psammophis* cf. *tanganicus*), and two at Ilkemere (*Bitis arietans, Varanus niloticus*) (Fig. 6). *Philochortus rudolfensis, P.* cf. *tanganicus,* and *R. rostratus* (and the *Trionyx triunguis* carapace) were found only on bushland transects; *A. lionotus, B. arietans, Hemidactylus barbierii*, and *Varanus albigularis* occurred exclusively in dry riverbeds; and *P. brevis* and *V. niloticus* were only found in the grassland transects at Ilkemere and Alia Bay, respectively (Fig. 6).

Most of the six species of amphibians (four species; *Ptychadena nilotica, Ptychadena* cf. *schillukorum, Sclerophrys turkanae,* and *Tomopterna wambensis;* Fig. 7) were found in the dry riverbeds, especially after rains. Three amphibian species were recorded in grasslands. Of those, *P. nilotica* and *S. turkanae* were found in the highly alkaline (pH = 9.2) and saline (TDS = 2,500 ppm; Yuretich and Cerling 1983) water of Lake Turkana. The fossorial *T. wambensis* either appeared from out of its underground hiding place away from the waters after rain, or it was calling at sites away from the lake at the edges of confined water bodies, which were most probably fed mainly by the high levels of groundwater and rain water. Of the three species recorded at TBI, *T. wambensis* and *Poyntonophrynus lughensis* were mating in a freshly flooded temporary waterbody after heavy rains in bushland, while *Sclerophrys xeros* was sitting in the artificial water reservoir of the station. Only a single individual of *P.* cf. *schillukorum* was found in a dry riverbed at Ilkemere (Fig. 8).

Discussion

The results of two herpetological surveys in the SNP along parts of the eastern shore of Lake Turkana in northern Kenya are presented here. In addition to the records of 28 reptiles and six amphibians from these surveys, a

checklist of the herpetofauna in an extended area east of Lake Turkana from the Ethiopian border in the north, east to the town of North Horr, and south to Mount Kulal was presented at the 6th Congresso Nazionale della Societas Herpetologica Italica in Rome, Italy in 2006 (Ziliani et al 2006). Our surveys added seven species of reptiles and two amphibians that were not found during the 10 herpetological surveys conducted by Ziliani et al. (2006), despite their coverage of a larger range and spending more time. These nine species are: *Holodactylus africanus, Homopholis fasciata, Philochortus rudolfensis, Psammophis* cf. *tanganicus, Ptychadena* cf. *schillukorum*, *Rhamphiophis rostratus, Sclerophrys xeros, Varanus albigularis,* and *Varanus niloticus.* Thirteen reptile species and two amphibians recorded by Ziliani et al. (2006) in xeric habitats were not detected in our surveys. Most likely these taxa also find suitable habitat in SNP and are expected to occur there (Table 1). We did not consider the species that were recorded by Ziliani et al. (2006) in the very ecologically different, more mesic vegetation types, including the afromontane forest remnants at Mount Kulal (14 species, excluding *Lygosoma afrum*, currently considered a synonym of *M. sundevallii* and *Psammophis semivariegatus*, which does not exist and is likely *Philothamnus semivariegatus*; Table 1).

Among the unique environmental features of the area for the local herpetofauna are (i) Lake Turkana, a permanent water source in this semi-desert, with a high pH and high salinity (for aquatic animals) and (ii) the terrestrial shoreline of the lake with localized grass-dominated habitats. Our results show the lowest species diversity in those grasslands, a fact that was unexpected. However, the grasslands seem to be experiencing the highest impact from local livestock overgrazing. In addition, the prolonged droughts in the area likely affect the grasslands through changes in the flooding regime and seasonal lake-level fluctuations. Along the shore, the four species that were not recorded anywhere else can apparently withstand the rather inhospitable chemical conditions of the lake water. Those four species are: *Crocodylus niloticus*, except for one individual that was found a little further inland near one of our bushland transects; *Varanus niloticus*, a monitor lizard that lives close to water; *Platyceps brevis*, this species is not aquatic and was recorded in anthropogenic habitat between the stones of the wall of a building; and the toad *Sclerophrys turkanae*. Furthermore, although they were not recorded alive during our expeditions, three aquatic species of turtles and terrapins (*Pelusios broadleyi, Pelomedusa subrufa* [sic], now *P. neumanni,* and *Trionyx triunguis*) are restricted to the lake (Ziliani et al. 2006). These species are subject to fishing pressure, and they often end up as bycatch, are disturbed by fishermen, become entangled in nets, or take baited fishing hooks and drown (IUCN World Heritage Outlook 2020).

The dry riverbeds also represent an important habitat, especially in such a dry area, mainly due to their high groundwater levels which are mandatory for the trees growing in the narrow riparian woodlands along the river. Consequently, we found most of the amphibian species in the riverbeds (*Ptychadena nilotica, Ptychadena* cf. *schillukorum, Sclerophrys turkanae,* and *Tomopterna wambensis*), as well as the more or less arboreal reptile species (*Agama lionotus*, *Hemidactylus barbierii*, *Hemidactylus ruspolii, Homopholis fasciata,* and *Lygodactylus somalicus*), although many of the latter also inhabited the shrubs in the bushland. Furthermore, the three individuals of *Varanus albigularis* were found exclusively along the riverbeds under loose bark of trees. The number of individuals we recorded is not a completely accurate representation of abundance because not every individual encountered was caught and marked. As a result, on each second surveying day per transect there was a possibility of re-recording of individuals.

In addition to the aforementioned aquatic and arboreal species, the recorded herpetofauna of the SNP comprises species typical of the semi-arid to arid savannas of East Africa. A few of the species, such as *Bitis arietans*, *Heliobolus spekii, Hemidactylus platycephalus, Homopholis fasciata, Mochlus sundevallii, Rhamphiophis rostratus, R. rubropunctatus, Trachylepis quinquetaeniata, T. striata, T. varia,* and *Varanus albigularis,* are widespread and generalist, also inhabiting moist and dry savanna areas. These species are generally distributed further to the south and enter parts of Central Africa. Furthermore, a few Palearctic taxa reach the Turkana area, such as *Echis pyramidum* and *Stenodactylus sthenodactylus*, as well as the largely Palearctic genus *Eryx* which is represented in SNP by *E. colubrinus*.

Environmental Changes over Recent Decades

Recently, the area around SNP has received more attention from biologists and conservationists than in the past (e.g., Cabeza et al. 2016; Conenna et al. 2019; Junqueira et al. 2021; Torrents-Ticó et al. 2021). The overall outcomes and impressions of these various studies are that throughout the past decades, the xeric areas in northern Kenya, including Lake Turkana and SNP, have been facing severe anthropogenic pressures. A 2 °C rise in minimum and maximum temperatures between 1967 and 2012 in the Turkana area has been reported (Avery 2012), as well as changes in the intensity and frequency of rainy seasons and increased duration and frequency of severe droughts (Junqueira et al. 2021). Ethnographic studies also report that the Daasanach people in the area have perceived increases in temperature and wind strength, drier and less fertile soils, less grass and increased water salinity (Junqueira et al. 2021). Photographic evidence from the 1960s shows that there was once a rich mammalian fauna in SNP, with giraffes, lions, and cheetahs, all of which are now locally extirpated (IUCN World Heritage Outlook 2020), and the local elders reported fertile and green pastures for their livestock in the past (Cabeza et al. 2016). Herders also report changes in the population trends of many of the mammals in the area (Torrents-Ticó et al. 2021). Whether these changes are also affecting the herpetofauna of SNP is less clear, since most reptiles and amphibians are less targeted by the local population than the mammals. Nevertheless, changes in the lake water levels and increased anthropogenic pressures with negative impacts

on the vegetation cover (shade), insect abundance (reptile and amphibian prey), ground water levels, and land use practices (agro-pastoralism, fishing), are likely to have already impacted the diversity and abundance of reptile and amphibian species.

Our results show that the majority of the herpetofauna of the SNP comprises desert and semi-desert taxa. Museum specimens are very rare for the eastern shore of Lake Turkana, which motivated us to collect voucher specimens of the local herpetofauna for the NMK collection to serve as a baseline for future generations of conservationists and biologists. The reptile and amphibian species recorded at Mount Kulal, which is about 100 km south of SNP and covered by afromontane forest remnants and mesophilous vegetation formations, show a herpetofauna community comprising species that typically occur in mesic savannas and forests further to the south and west, e.g., *Bufo* (*Sclerophrys*) *gutturalis, Crotaphopeltis hotamboeia, Dispholidus typus, Gerrhosaurus flavigularis,* and *Philothamus semivariegatus* [sic] (*Philothamnus semivariegatus*) (Ziliani et al. 2006). These species seem to represent relict populations for the area, and they were likely to be more widespread under the less severe environmental conditions which were reportedly still prevalent in the Turkana region less than 50 years ago (Cabeza et al. 2016; Junqueira et al. 2021; Torrents-Ticó et al. 2021). The opportunistically recorded field body temperatures of some of the species (see Species Accounts) were not exceptionally high, so we assume that at least those taxa were able to effectively thermoregulate in the SNP despite the increased environmental temperatures (Avery 2012).

Conclusions

The SNP harbors a high diversity of reptiles, and also a decent amount of amphibian taxa for a xeric environment, and many of these taxa are poorly studied. During two surveys, a number of species were found for the first time in SNP, although none of them were unexpected based on their known ecology and distribution ranges. There are probably some more species to discover in the area, and splitting taxa based on molecular analyses might further extend the species list. Based on the present survey and the expeditions by Ziliani et al. (2006), the currently known reptile and amphibian fauna of the SNP comprises 49 species, including eight amphibians and 41 reptiles (three freshwater turtles, one crocodile, 25 lizards, and 12 snakes).

The herpetofauna includes species typical of the semi-arid to arid savannas of East Africa (including arboreal taxa), a few taxa with more Palearctic distributions, a few widespread and generalist taxa that also inhabit more humid areas, and the aquatic species dependent on Lake Turkana. The latter group comprises four reptile species listed on CITES App. II and two reptile species listed on the IUCN Red List, highlighting the importance of the lake for the Reptilia. These species are also the most likely group to be affected if the water resources, including the amount of available water and the chemistry of the lake, are negatively impacted by climate change and the Gilgel Gibe III Dam in Ethiopia. In addition, the habitats associated with the ephemeral rivers that have high groundwater levels and riparian woodlands/forests, which are home to most amphibian species and many reptile species, will be heavily affected if water levels drop. The grassy habitats along the lake shore seem to be impacted by overgrazing and now harbor fewer reptile and amphibian species than expected. Overall, the herpetofauna of this area includes a number of CITES and IUCN Red List listed species, including endemics, that warrant protection and conservation measures to prevent further defaunation.

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